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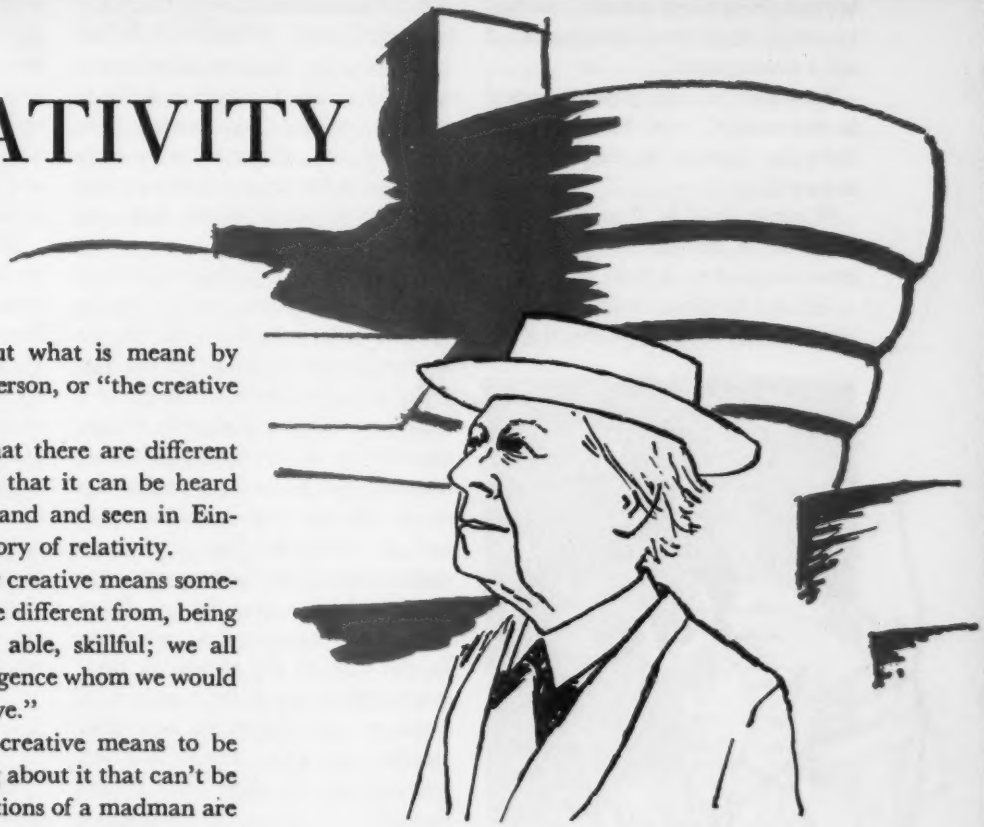
CREATIVITY



ALL of us have notions about what is meant by "creativity," or a "creative" person, or "the creative process."

We know, for one thing, that there are different kinds and levels of creativity: that it can be heard in the jam session of a jazz band and seen in Einstein's development of the theory of relativity.

We realize that being highly creative means something more than, or at any rate different from, being highly intelligent, competent, able, skillful; we all know able people of high intelligence whom we would never dream of calling "creative."

We understand that to be creative means to be original—although on thinking about it that can't be all there is to it. The hallucinations of a madman are often highly original, but we do not call them, or him, "creative."

As far as the creative process goes, we sense that creative individuals seem to "go at things" in a way that is somehow different from the way most of us do, but we (and they) are not sure precisely how.

We also have ideas about what the creative person is like; we feel in a vague way that we should not expect of him exactly the same kind of behavior and response that we expect of others. We even realize that he usually works better under certain conditions; "just leave him alone," we sum it up.

All of these ideas about creativity are true as far as they go, but they are vague and partial truths. We admire creativity, value it, and believe that we should encourage it. Yet we can do little to foster the "creative situation" until we know more about the nature of creativity itself.

We need to know more about what creative individuals are *like* as people. Are there patterns of attitudes, values, interests, and personality that distinguish them from less creative persons?

We need to know more about the creative process. How does the original thinker think?

We need to know more about the kinds of environments that foster—or smother—creativity and high performance. What kinds of support do creative workers need from supervisors, colleagues, society in general?

The research programs described in the following pages are directed to these questions.

The Creative Person

MARK TWAIN told about the visitor to heaven who told St. Peter he wanted to meet the greatest general who had ever lived. St. Peter obligingly pointed out a nearby angel.

"But that isn't the greatest general in the world!" cried the visitor. "I knew that man in life, and he was a mere cobbler."

"I know," said St. Peter, "but if he had been a general he would have been the greatest of them all."

This is a favorite story of Donald W. MacKinnon, director of the University of California's Institute of Personality Assessment and Research (IPAR), which has been conducting a Carnegie-supported study of creativity for six years. Some day, Professor MacKinnon and others hope, it may be possible to *predict* creativity. But starting from here and now, if you want to study that elusive quality you have to study people who have *proved* they are creative.

The IPAR group wanted to learn not only how highly creative people differ in general from people who are less creative, but also how persons who are creative in different fields differ—or do not—from one another. Consequently they have studied 1) novelists, essayists, and poets; 2) industrial research scientists and mathematicians; and 3) architects. The individuals studied were chosen because they were rated as highly creative by distinguished personages in their own fields. In the case of the architects, three groups were chosen for comparative purposes: one judged to be highly creative; the next creative but not markedly so; the third more run-of-the-mill.

Three Kinds of Creativity

The categories in which these men and women work were selected because they represent the three different kinds of creativity which the IPAR had identified.

In the first of these, the creation is clearly an expression of the inner states of the creator. Composers, expressionist painters, sculptors, and of course creative writers, fall into this category.

In the second form of creativity, the creator acts largely to meet externally defined needs and goals. He produces a novel and appropriate product, but he adds little of himself to the result. Experimental physicists, engineers, inventors, and research scientists are representative of this category.

The third form of creativity cuts across the other two, in that the product is both an expression of the creator—and thus a very personal product—and at the same time a meeting of the demands of some external problem. Architects are perhaps the best example of this; others are certain kinds of writers, representational painters, and musical performers.

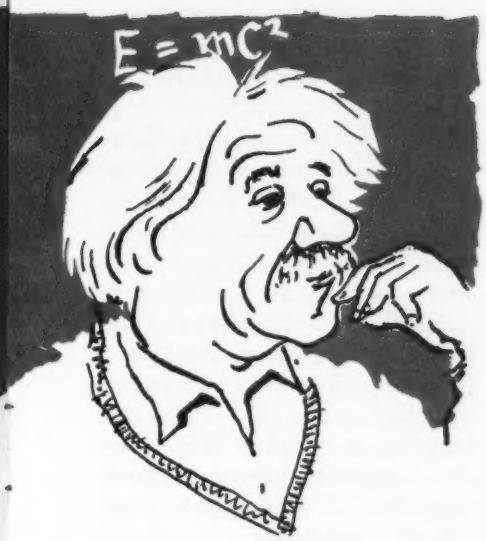
The creative "subjects" were studied by the method of personality assessment developed by the Office of Strategic Services during World War II. This method involves the administration of a number of different tests, questionnaires, personal interviews, and the eliciting of biographical information. It is possible in this way to learn a great deal about the attitudes, values, interests, preferences, and life histories of individuals. A composite picture of the "person as a whole" emerges. How do creative "people as a whole" look?

Creative People as People

They are fairly intelligent, at least. ("We had no feeble-minded subjects," says Mr. MacKinnon.) But although a certain amount of intelligence is required, beyond that point being more or less intelligent does not crucially determine the level of an individual's creativity.

What about special aptitudes? Early in life creative individuals show the skills necessary to their ultimate careers: architects were good at drawing as children; mathematicians always had a talent for math. But many creative people come to their final careers late, because they have so many skills and aptitudes that they find it difficult to choose among them.

Clearly it takes more than intelli-



gence and specialized skills for creativity, so we look to see what *interests* characterize highly creative persons.

All of them score high on interests which might lead them to be psychologists, architects, author-journalists. All score low on scales for purchasing agents, office workers, bankers, farmers, carpenters, policemen—and morticians. (This does not mean that no farmers or bankers are creative. And it should be remembered that a high level of creativity is not necessary to—or even appropriate to—certain occupations. One might hesitate to entrust the nation's security to an army composed of highly creative men.)

From the decisive pattern of interests which distinguishes highly creative people, however, we may infer—and other signs support the conclusion—that creative talent is not very interested in small detail, in the practical and the concrete, but is more concerned with the meanings, implications, and symbolic equivalents of things and ideas.

Since creative people show a strong congruence of interests, do they also share the same values? They do—and the values they share are surprising in some respects.

The German psychologist Spranger has described the six basic values of men as being the aesthetic, economic, political, social, religious, and theoretical. Tests have been devised to measure the relative strength in which these values are held by individuals.

Truth and Beauty

For all the creative types, the aesthetic and the theoretical are the strongest; the economic tends to be the weakest. What is surprising is that the two values which are usually considered to be conflicting are so high and of so nearly the same strength for all creative groups. One would expect a mathematician to value highly the theoretical, which has to do with a rational concern for knowledge and truth. One would expect an architect to value highly the aesthetic, which represents an emotional concern for beauty and form. But that both—and all the other creative groups—give the two values almost equal weight leads to an important conclusion about creative people in general. That is that they are able to tolerate the inner tensions created by holding conflicting values, or—probably closer to the truth—that they *resolve* the conflict. This kind of resolution can be seen in the creative mathematician who ignores certain obvious solutions to a problem in favor of arriving at an "elegant" or beautiful solution.

Other findings support the hypothesis that creative individuals are more able than most to give expression to opposite sides of their nature, to achieve a reconciliation of the conscious and unconscious, reason and passion, rational and irrational, science and art. All the highly creative male groups studied, for example, scored high on a "femininity" test: more open in their feelings and emotions, more sensitively aware of themselves and others, and possessing wide-ranging interests—traits which in our culture are considered "feminine." On the other hand, most of them were not effeminate in manner or appearance, but instead assertive, dominant, and self-confident.

Another indication that creative people are more open to experience from within and without is that they seem to have a positive preference for complexity—even for what appears as disorder. When presented with a series of drawings of various types they consistently choose those which are more abstract, perhaps chaotic; when offered an opportunity to make mosaic patterns using many or few colors, the highly creative tend to employ more colors, the less creative, fewer.

It seems that the less creative person has to impose order immediately,

but that the more creative sees the possibility of imposing a higher level of order having previously experienced more disorder.

Personality Types

So far all the creative types have been, with slight variations, much alike in interests, values, and preferences. It is when we come to seeing how they fit into the scheme of "personality types" described by Jung that we see the first significant difference among the "creatives." Even here, in one respect they are most strikingly similar to one another—and in that same respect most startlingly different from the general population.

Whenever you think, you either become aware of something (perceive) or come to a conclusion about something (judge). Most people show a pretty consistent preference for one of these attitudes, preferring either to judge or to perceive. A judgmental type of person places emphasis upon the control and regulation of experience, while a perceptive type is inclined to be more open and more receptive to all experiences. He seeks to know as much as possible about life.

The great majority of mathematicians and research scientists prefer the judging attitude; among writers, the preference is strikingly reversed. About 80 per cent of them are perceptives. And of the most creative architects, 58 per cent are perceptives; of the next group, only 44 per cent are; and in the least creative the percentage drops to 17 per cent.

In Jung's scheme, the second preference is for one of two types of perception: sense-perception, which is a direct becoming aware of things by the way of the senses; and intuitive-perception, which is indirect perception of the deeper meaning and possibilities inherent in things.

In the general population, three out of every four persons are sense perceptives. They concentrate on things presented to their five senses, and they focus their attention upon existing *facts*. The one out of every four who perceives intuitively looks expectantly for a link between something present and something not yet thought of, focusing habitually upon *possibilities*.

Highly creative people in all fields are overwhelmingly intuitive: 93 per cent of the writers, 90 per cent of the mathematicians, 100 per cent of the most creative architects.

We would not expect highly creative persons to be bound to "what *is*"; we would expect them to be alert to "what *could* be," the as-yet-not-realized. But the fact that almost 100 per cent of them are so, as contrasted with only 25 per cent of the general population, is an impressive finding of deep significance.

Feeling and Thinking

If we use sense perception to tell us what is and intuition to tell us what may be, we use thinking and feeling in judging and evaluating our experience. Thinking is a logical process, aimed at impersonal fact-weighing or analysis. Feeling is a process of appreciation and evaluation of things which gives them a personal and subjective value.

As might be expected, mathematicians, about 70 per cent of them, show a strong preference for thinking; writers show an equally strong preference for feeling—and architects split almost 50–50.

The final preference set is the well-known one between introversion and extraversion. The extravert's primary interests lie in the outer world of people and things, while the introvert's primary interests lie in the inner world of concepts and ideas.

It is not surprising that among writers there are almost as many extraverts as introverts. Among mathematicians, again to no one's surprise, there is a strong preference for introversion, with about 80 per cent being introverted. Architects also show a preference, although not so strongly, for introversion.

It is impossible to conclude a discussion about the creative person without mentioning conformity, which is such a popular (and unpopular) word today. The creative person is, almost by definition, not a conformist. His nonconformity lies in the realm of ideas, however—not necessarily of behavior. Hence he seldom fits the layman's stereotype of him. The IPAR has found that he is not usually the emotionally unstable, sloppy, loose-jointed Bohemian. The truly creative person is simply independent.

The Creative Situation

The IPAR has studied many other aspects of creativity, including the creative process. A number of publications are forthcoming, including two books: one on architects by Mr. MacKinnon and Wallace B. Hall, and one on writers by Frank Barron.

But given what we already know about what the creative person is like and how he operates, what can we deduce about how creativity can be encouraged in the young, fostered

through the educational system, and later released and realized in work?

It must be reported that creative people claim more than others do that their childhoods were not entirely happy. (They may be telling the objective truth, or it may be that this is simply another sign of their often-noted ability to see accurately and accept what others may repress.) At any rate, the finding should not be interpreted by parents as meaning that they should make their children miserable in the hope of making them creative. It and other findings do mean, however, that parents should not force too much "togetherness," that they should not prevent the child from turning in on himself. And efforts to produce "well-rounded" children, made often by both parents and schools, are not conducive to creativity.

"Creative people are not well-rounded; they have sharp edges," says Mr. MacKinnon. "They are real human beings, not protoplasm."

Speaking of the schools, they of course have a very important—and difficult—role to play in fostering creativity. Often the creative person is not a "satisfactory" student. He resists group work. He may set himself goals which are in conflict with those set for the class. He wants to follow his own interests.

One of the best methods by which the schools can nurture creative talent is to de-emphasize group participation with its demands for conformity, and to provide maximum opportunities for the able student to work out his own interests. The best method of all is to have creative teachers!

Role of the Colleges

The colleges and universities too must be more alert both to identify and sustain creative talent. Thus far almost exclusive emphasis has been placed on the intellectual capability of students, with little regard paid to searching for those other aspects of the personality which mark the creative person. As the pressure of numbers increases, there is a great tendency to prefer "sound" students to those who may or may not prove to be truly original. And professors do not always recognize creativity when they see it. One of the most highly original architects studied by the IPAR had been advised by his dean to drop architecture because he had no talent for it.

Industry and government too have roles to play in fostering creativity, if that is what they want to foster. Some personnel practices are positively inimical to the creative process. The idea of a time-clock, for example, is meaningless to a truly creative person. At times he may appear to be doing nothing at all; at other times he may work for 24 hours without eating or sleeping. There is evidence, too, that the fashionable practice of "brain-storming"—having persons in a group suggest ideas in as rapid succession as possible—is not particularly productive of unique ideas. In fact, the IPAR says it appears that the group process inhibits creative thinking.

Actually, the creative person—whether in school or society—is the victim of the sharp conflict of values in our society today: the emphasis upon the integration of the individual into the group and its activities on the one hand, and upon the nurturing of creative talent on the other. All evidence points to the fundamental incompatibility of these opposed values and goals.

A Different Drummer

Creative talent has always existed and managed to flower. It will continue to do so. But if we want positively to encourage it, actively to nurture it, the conflict must be settled in favor of the individual. Such a settlement will come only when, as a society, we come more generally to understand that if a man seems out of step with his fellows, it may be because, as Thoreau said, "he hears a different drummer. Let him step to the music which he hears, however measured or far away."

The Creative Process

An individual is not creative in a vacuum. He is creative some*where:* in an industry, or a government office, or an academic institution—an environment. That environment will affect the degree of his creativity. On the other hand, the most "creative environment" in the world cannot bring out creativity in an individual who just doesn't have it.

Yet, according to psychologist Morris I. Stein, too often research concentrates unduly on one or the other of the two aspects of creativity: on the individual, or on the environment. Many psychologists, in directing primary attention to a person's intelligence, attitudes, personality, etc., tend to de-emphasize the social milieu within which he works, Professor Stein suggests. They tacitly assume that the potentially creative individual will somehow realize his creativity.

Sociologists and anthropologists, on the other hand, tend to de-emphasize the individual and his psychological characteristics, says Mr. Stein. They make the assumption that the demands of the environment (read as "culture" in this sense) are strong enough to require fulfillment regardless of existing individual differences. They point to the fact that many inventions have been made simultaneously by different people; they emphasize the importance of the cultural values of a given society in producing different kinds of creativity (creativity in the arts in Renaissance Italy; creativity in technology in the 20th Century United States).

Neither viewpoint is wholly adequate on its own, Mr. Stein believes. Since creativity is a function of the transaction between an individual and his environment, the two must be examined together. For many years, first at the University of Chicago and now at New York University, Mr. Stein has studied a number of industrial research chemists, working in several different industrial laboratories, from the point of view of both their personality characteristics and the environments in which they work. In recent years his research has had support from Carnegie Corporation.

Many of Mr. Stein's findings with respect to the personality characteristics of the sample of creative individuals he studied tally with those of the IPAR described in the preceding article, although he did not test for all the same qualities. He too found that the more and less creative chemists (they were divided into two groups) do not differ significantly in tests of verbal intelligence. He found that the more creative men are more autonomous and dynamic, and at the same time less anxious, than the less creative. The more creative have fewer authoritarian attitudes than the less creative; and while both groups assign high priority to the theoretical value, the more creative individuals give greater weight to the aesthetic also.

Mr. Stein has made interesting observations of the way in which creative individuals work. The creative man seems to know when to be disciplined (for discipline is essential to creativity) and when not. He is more likely to *play*, in a certain sense, with things and ideas. He is willing to allow all kinds of ideas and feelings to enter his mind; he can accept his own impulses.

We speak often of "attacking" a problem, and that is precisely what most of us do. But highly creative men, in Mr. Stein's observation, are not so likely to try to force or pull out a solution; they tend to become part of the problem field, sensing its forces and following its leads, and thus to let the problem "solve itself."

Less creative workers seem more oriented toward quick achievement. The more creative work more slowly at first, marshalling resources. Then they move quickly, with an air of certainty, to a synthesis. The less creative try to achieve a synthesis earlier, but then keep checking back, retracing steps. In the long run, they are not as efficient, and in working on their research problems they are not as likely to achieve creative solutions.

What about the environment? The industrial research chemist (and the same things would apply to any number of other workers) has five roles to play. He is a scientist, a professional, an administrator, an employee, and a social being. These roles are sometimes in conflict with one another—and sometimes in conflict with the personality characteristics of a creative person. The big question is, to what extent does the creative individual need to fit into the system and yet rise above it?

Mr. Stein concludes that scientific creativity can occur only in the fulfillment of the scientific and professional roles; or rather, it cannot occur without fulfillment of those roles. But some fulfillment of the employee and social roles is usually necessary also. The individual must gain the opportunity to

be creative; he often does so by fulfilling satisfactorily at least some aspects of his employee and social roles. This involves certain problems.

The social role involves the acceptance of tradition; the scientific role questions it. Unless the individual is able to make this distinction and not permit behavior in one area to generalize to the other, he may have difficulty. The second problem is that in the course of being a "good" employee and a "good" social being, the individual finds his energy drawn away from following up on ideas—in short, his creative role may be threatened. The people who *prove* to be creative obviously have managed to reconcile these roles.

Mr. Stein is now studying how it may be possible to predict creativity. This will be easier to do, he is convinced, when we begin to understand more about the creative person's roles as well as his personality characteristics.

The Creative Situation

SCIENTISTS, generally speaking, are more creative when they are slightly uncomfortable. They need to be jarred by the unexpected, forced to an unusual—or creative—response by a condition of intellectual uncertainty or "dither."

Anxiety, on the other hand, seems to inhibit creativity. To be creative one must risk the unknown; a certain amount of security must underlie the courage to adventure. Yet the conditions that produce uncertainty are also likely to produce anxiety.

What is needed, then, is enough uncertainty to stimulate innovation, but enough security to offset the anxiety that uncertainty arouses. Maximum creativity should thus be found in situations containing both high dither and high security.

This is a hypothesis formulated by a group at the University of Michigan's Institute of Social Research (ISR), on the basis of studies they are making of the conditions that seem to lead to high scientific performance. Started under a National Institutes of Health contract some years ago, the program has since had support from various sources, including Carnegie Corporation. The research is directed by Donald C. Pelz.

In their first study, the ISR group was struck by the fact that the factors which seem to bear on scientific performance are a rather heterogeneous assortment. They include such things as the scientist's professional motivations or orientations; how often he communicates with colleagues and with chiefs; how similar or dissimilar he is to his associates; how long he has been with his group; and others.

In trying to discover some underlying order, the ISR group saw a pattern emerging. The clearest results seemed to occur when at least two factors were operating: one a source of uncertainty; the other a source of security. These sources can be found in different places: within oneself, or in the social environment, or in work itself. Different people will draw upon different sources.

One person, for example, may have a good deal of inner security and lack of anxiety, but he may not generate many ideas himself. He may find the necessary condition of uncertainty in the work itself: a problem may challenge him to creative action. Or colleagues may raise questions which have the same effect.

Another man, however, may be highly aware of conditions of uncertainty—so highly, in fact, that he feels anxious. The security he needs in order to be creative may come from the reassurance and support of his colleagues and superiors.

The ISR group is now studying more than 1,300 scientists and engineers in eleven different locations: five industrial laboratories, five government laboratories, and one university. The research focuses on the nature of the work being done, the kind of organization in which it is carried out, and the kinds of individuals who are doing it. Special emphasis is laid upon the motivations of the scientists, and upon their relationships with their colleagues and superiors. How these factors relate to several measures of scientific performance is being examined.

There is reason to believe that this larger study may lead to knowledge of the ways in which working conditions may be created—or altered—to draw forth the highest level of creative performance from talented persons.

New Grants

Grants amounting to $4,306,000 were voted during the third quarter of the fiscal year beginning October 1, 1960. Included are those listed below:

Bennett College, for a Saturday school for gifted high school students, $75,000.

University of California, for research on creativity and self-teaching devices, $100,000.

Harvard University, for research and development in programed instruction, $300,000.

Indiana University, for an overseas language program for Indiana high schools, $200,000.

University of Oregon, for training and research in international studies and overseas administration, $150,000.

The Population Council, to establish a center at Princeton University for African demographic studies, $120,000.

University of Texas, for a program of research and graduate study on thought processes, $82,200.

GRANTS IN PROGRESS

In an effort to create some real and lasting student interest in today's dynamic happenings in and among the many countries of the world, San Francisco State College in 1958 organized an experimental program in international relations. All courses focus on the great political, social, and economic changes taking place in this century and their national and international significance. Rather than using standard texts, Charles McClelland, director of the program, and other faculty members have collected articles from many sources.

Six of these collections have been published as the first volumes in the Chandler Studies in International and Intercultural Relations (Howard Chandler, 660 Market Street, San Francisco 4, publisher). They are titled *United States Foreign Aid; Nationalism and International Progress; The Underdeveloped Lands; The United Nations; Nuclear Weapons, Missiles, and Future War;* and *Propaganda and International Relations.*

The Minnesota program for the continuing education of women has completed its first year. More than 300 women—with formal education ranging from eighth grade to the Ph.D.—are enrolled in the continuing education phase of the program; about 25 undergraduates at the University of Minnesota are in the preparatory phase. Two seminars for adult women are already in existence; a new one will be started in the fall. A description of the Minnesota plan is now available from the Women's Continuing Education Program, the University of Minnesota, Minneapolis 14, Minnesota.

The Center for Programed Instruction, established to experiment with self-teaching techniques, to design programs, and to disseminate information about developments in programed instruction, published its first bulletin in May. Through it the Center intends to keep teachers and others interested in education up to date on experiments in programing, recent research, and experts' views on some controversial questions. The bulletin is available free of charge from the Center at 365 West End Avenue, New York 24.

"Civil Liberties and Military Power in Time of War" by Fred L. Morrison, a senior majoring in political science, mathematics, and German, and "The Effect of Temperature on the Adenosine Triphosphate Firefly Luminescence Reaction" by Don Eugene Detmer, a senior chemistry major who has spent four years in biological research, are two examples of the papers presented in the first issue of *Search*, a 66-page booklet subtitled "Selected Studies by Undergraduate Honors Students at the University of Kansas." The University's College of Liberal Arts and Sciences published *Search*, explains Dean George R. Waggoner in the preface, to provide students, faculty, and observers a representative sample of the students' accomplishments last year. The work of the students in the honors program has also appeared in scholarly journals and has been acknowledged by faculty members in their own articles and papers.

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Each issue of the Quarterly describes only a few of many Carnegie-supported projects in a variety of fields. Full listings of all the Corporation's activities are contained in its annual reports, which usually are published in January.

Carnegie Corporation of New York is a philanthropic foundation created by Andrew Carnegie in 1911 for the advancement and diffusion of knowledge and understanding. It has a basic endowment of $135 million and its present assets, reckoned at cost value, are approximately $214 million. Approximately 7 per cent of the income may be used in certain British Commonwealth areas; all other income must be spent in the United States.

The Corporation is primarily interested in higher education and in certain aspects of international affairs. Grants are made to colleges and universities, professional associations, and other educational organizations for specific programs. In higher education, these include basic research, studies of educational developments, training opportunities for teachers and administrators, and other educational projects of an experimental nature. In international affairs, the Corporation is concerned primarily with research and training programs which promise increased understanding of the problems the nation faces and which provide better selection and training of young men and women who must deal with these problems.

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